

I claim:

1. A multi-stage collector system for removing particulate matter from a gas flow stream, the particulate collector comprising:

5

at least two plate electrodes in approximately parallel relation to each other each connected to a first electrical potential, said plate electrodes extending in the direction of said gas flow stream and forming spaced alternating zones;

10

at least one barrier filter situated in at least one of said alternating zones, said barrier filter connected to a second electrical potential;

15

at least one discharge electrode situated in at least one of said zones, said discharge electrode also connected to said second electrical potential.

20 2. The multi-stage collector system of claim 1 wherein said plate electrodes form alternating wide and narrow zones, said barrier filter situated in at least one of said wide zones, said discharge electrode situated in at least one of said narrow zones.

3. The multi-stage collector system of claim 1 wherein said first and second electrical potentials are chosen to cause corona discharge from said discharge electrode to said plate electrodes.

5 4. The multi-stage collector system of claim 1 wherein said barrier filter is electrically conductive.

5. The multi-stage collector system of claim 1 wherein said discharge electrode is attached to said barrier filter.

10

6. The multi-stage collector system of claim 5 wherein said discharge electrode is also electrically connected to said barrier filter.

15 7. The multi-stage collector system of claim 1 further comprising a means in communication with said electrodes and said barrier filter for recovering recyclable waste products.

20 8. The multi-stage collector system of claim 7 wherein said recyclable products contain metals.

9. The multi-stage collector system of claim 7 wherein said recyclable products contain halogens.

25 10. The multi-stage collector system of claim 1 wherein said gas stream is gas from a gasifier system.

11. The multi-stage collector system of claim 1 wherein said gas stream is from a fluidized bed combustion plant.

12. The multi-stage collector system of claim 1 wherein said gas  
5 stream has a temperature greater than 350 degrees C.

13. The multi-stage collector system of claim 1 wherein said gas stream has a pressure of greater than 5 bar.

10 14. The multi-stage collector system of claim 1 wherein said barrier filter is coated with a catalyst.

15. The multi-stage filter of claim 1 wherein said barrier filter comprises a dielectric outer surface and a conductive inner surface, whereby discharge takes place through said dielectric surface.  
15

16. A multi-stage collector for removing particulate matter from a gas stream comprising a repeating series of corona generating means with non-uniform electric field for generating a plurality of ions; collector means with relative uniform electric field for collecting particulate matter with said ions attached, and a barrier filter means with relatively uniform electric field for further filtering said gas stream by filter action whereby remaining  
20  
25 particulate matter is further removed from said gas stream.

17. The multi-stage collector of claim 16 wherein said corona generating means is a flat plate with sharp leading and/or trailing edges.

5 18. The multi-stage collector of claim 16 wherein said barrier filter means has a cylindrical cross-section.

19. The multi-stage collector of claim 16 wherein said barrier filter means has an elliptical cross-section.

10

20. The multi-stage collector of claim 16 wherein said barrier filter means includes a porous material.

21. The multi-stage collector of claim 16 wherein said barrier  
15 filter means includes a porous medium with a conductive surface.

22. The multi-stage collector of claim 16 further comprising a catalyst in contact with said barrier filter means.

20 23. The multi-stage collector of claim 22 wherein said catalyst is an oxide of vanadium.

24. The multi-stage collector of claim 16 wherein said corona discharge means is attached to said barrier filter.

25

25. The multi-stage collector of claim 16 wherein said corona discharge means is an elongated rod.

26. The multi-stage discharge collector of claim 16 wherein said  
5 collector means and said corona discharge means are connected across an electrical potential significantly different from zero volts.

27. The multi-stage discharge collector of claim 26 wherein said  
10 electrical potential is DC.

28. The multi-stage discharge collector of claim 26 wherein said electrical potential is AC.

15 29. A method for removing particulate matter from a gas flow stream comprising the steps of:

passing a gas stream between two plate electrodes in approximately parallel relation to each other each connected  
20 to a first electrical potential;

placing at least one barrier filter in said gas stream, said barrier filter connected to a second electrical potential;

placing at least one discharge electrode in said gas stream,  
said discharge electrode also connected to said second electrical potential;

5 causing said discharge electrode to corona discharge to at least one of said plate electrodes.

30. The method of claim 29 wherein said barrier filter includes a conductive surface.

10

31. The method of claim 29 wherein said barrier filter comprises a dielectric outer surface and a conductive inner surface, whereby corona discharge takes place through said dielectric surface.

15

20

25